IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant:	ATKINS, et al.	Patent Application	
Application No.:	09/800,638	Group Art Unit:	2624
Filed:	March 7, 2001	Examiner:	Rosario, Dennis

For: DIGITAL IMAGE APPEARANCE ENHANCEMENT AND COMPRESSIBILITY IMPROVEMENT METHOD AND SYSTEM

APPEAL BRIEF

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I. Real Party in Interest

The assignee of the present invention is Hewlett-Packard Development Company, L.P.

II. Related Appeals and Interferences

There are no related appeals or interferences known to the Appellants.

III. Status of Claims

Claims 1-17 and 19 are rejected. Claim 18 is allowable if rewritten in independent form including the limitations of their base Claims and any intervening Claims. Claim 20 is cancelled. This Appeal involves Claims 1-17 and 19.

IV. Status of Amendments

All proposed amendments have been entered. An amendment subsequent to the Final Action has not been filed.

V. Summary of Claimed Subject Matter

Independent Claims 1, 8 and 15 of the present application pertain to embodiments associated with an image processing system and a method for processing a digital image. Specifically, the claimed embodiments are directed to an image processing system including a filter selection mechanism for "generating a filter identifier based on one of an edge parameter computed based on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window", as claimed.

As recited in Claim 1, an image processing system is described. This embodiment is depicted in Figure 2. As shown at Figure 2, appearance enhancement and compressibility improvement mechanism (AECIM) 140 is illustrated (page 9, lines 3-7). AECIM 140 includes filter selection mechanism 230 and filter application unit 240 (page 9, line 28, through page 10, line 2). In one embodiment, filter selection mechanism 230 includes an edge parameter evaluation unit 234 for computing an edge parameter corresponding to the input pixel window and utilizing the edge parameter to select an appropriate filter (page 10, lines 12-15). In one embodiment, filter selection mechanism 230 includes an activity metric evaluation unit 238 for computing a metric of activity in the input pixel window and utilizing the activity metric to select an appropriate set of filter coefficients for the input pixel window (page 11, lines 4-7). Filter selection mechanism 230 indicates an appropriate filter that has been selected in filter identifier 236 (page 12, lines 1-3). Filter application unit 240 receives filter identifier 236 and applies the filter identified in filter identifier 236 to the input pixel window 210 to generate an output pixel (page 12, lines 4-8).

As recited in Claim 8, a method for processing a digital image having a plurality of input pixels is described. First, an input pixel window is received. Second, a filter identifier is generated based on either an edge parameter computed based on the input pixel window or an activity metric computed based on the input pixel window. Third, a filter specified by the filter identifier is applied to the input pixel window to generate an output pixel corresponding

to the current input pixel (page 14, lines 16-21). This embodiment is depicted in Figure 5. As shown at step 500 of Figure 5, a window of pixels is received (page 14, lines 24-25). An enhancement filter is selected and applied to the input pixel window, as shown at step 540 (page 15, lines 11-17).

As recited in Claim 15, a method for processing a digital image having a plurality of input pixels is described. First, an input pixel window is received. Second, a filter identifier is generated based on either an edge parameter computed based on the input pixel window or an activity metric computed based on the input pixel window. Third, a filter specified by the filter identifier is applied to the input pixel window to generate an output pixel corresponding to the current input pixel (page 14, lines 16-21). This embodiment is depicted in Figure 5. As shown at step 500 of Figure 5, a window of pixels is received (page 14, lines 24-25). A level of variation within the first window is computer at step 510 (page 14, lines 25-26). At step 520, a determination is made as to whether the level of variation is in a predetermined relationship with a predetermined level of variation (page 15, lines 3-4). At step 530, the current pixel is replaced by a blurred version of the pixel, thereby increasing the compressibility of the current region of the image, e.g., a first filter is applied (page 15, lines 8-9). At step 540, when the level of variation is not in a predetermined relationship with a predetermined level of variation, an enhancement filter is selected based on edge information and applied to the input pixel window, thereby improving the appearance of the current region of the image (page 15, lines 11-17)

VI. Grounds of Rejection to Be Reviewed on Appeal

Claims 1-17 and 19 are rejected under 35 U.S.C. §102(e) as being anticipated by United States Patent 6,646,762 by Balasubramanian et al., hereinafter referred to as the "Balasubramanian" reference.

VII. Argument

1. Whether Claims 1-17 and 19 are anticipated under 35 U.S.C. § 102(e) by Balasubramanian.

Claims 1-17 and 19 are rejected under 35 U.S.C. § 102(e) as being anticipated by Balasubramanian. Appellants have reviewed the cited reference and respectfully submit that the present invention as recited in Claims 1-17 and 19 is not anticipated by Balasubramanian in view of the following rationale.

Appellants respectfully submit that Balasubramanian does not teach or suggest the image processing system set forth in Claim 1. Furthermore, Balasubramanian does not teach or suggest the method for processing a digital image set forth in Claims 8 and 15. More specifically, Balasubramanian does not teach or suggest the expressly recited limitation of "generating a filter identifier based on one of an edge parameter computed based on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window", as recited in Claim 1, and similar recitations of Claims 8 and 15.

Appellants respectfully assert that Balasubramanian and the claimed invention are very different. According to the Federal Circuit, "[a]nticipation requires the disclosure in a single prior art reference of each claim under consideration" (W.L. Gore & Assocs. v. Garlock Inc., 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983); see also MPEP 2131). However, it is not sufficient that the reference recite all the claimed elements. As stated by the Federal Circuit, the prior art reference must disclose each element of the claimed invention "arranged as in the claim" (emphasis added; Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984); see also In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990); see also MPEP 2131). In other words "[t]he identical invention must be shown in as complete detail as is contained in the ...claim" (emphasis added; Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989); see also MPEP 2131).

Claim 1 sets forth an image processing system comprising: "a filter selection mechanism for receiving an input pixel window and responsive thereto for generating a filter identifier based on one of an edge parameter computed based on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window," (emphasis added). Claims 8 and 15 set forth similar limitations.

Appellants respectfully submit that Balasubramanian and the claimed embodiments are very different. Appellants understand Balasubramanian to teach a gamut mapping process for preserving local luminance differences. Balasubramanian teaches that different filters meant to filter different size areas can be applied to different size areas. In particular, Balasubramanian teaches that activity levels for different size areas are computed in selecting a filter.

Appellants respectfully assert that Balasubramanian does not teach, describe or suggest "generating a filter identifier based on one of an edge parameter computed based on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window" as claimed (emphasis added). With reference to Figures 6 and 10, Appellants understand Balasubramanian to teach a filtering function that may be implemented at a metric function 400 that applies its output to filter selector 302 to select an appropriate filter for spatial filter 104 (col. 7, lines 60-63). A small area activity metric is calculated for a small area (e.g., 5x5) and a large area activity metric is calculated for a large area (e.g., 15x15) (col. 7, lines 64 through col. 8, line 8). In particular, the small activity metric and the large activity metric are calculated based on different size areas. In other words, Appellants respectfully assert that the small activity metric and the large activity metric are calculated based on different input windows.

In contrast, embodiments of the claimed invention as recited in Claim 1 recite the limitation of "generating a filter identifier based on one of an edge parameter computed based

on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window" (emphasis added). In particular, the claimed embodiment provides for computing an edge parameter and an activity metric where both are "computed based on the input pixel window" as claimed (emphasis added). Accordingly, the claimed embodiment provides for computing an edge parameter and an activity metric use the same input window.

Appellants respectfully assert that Balasubramanian does not teach, describe or suggest "generating a filter identifier based on one of an edge parameter computed based on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window" as recited in independent Claims 1 and 8. In contrast, Balasubramanian teaches calculating different activity metrics based on different input windows. By explicitly teaching that the activity metrics are calculated based on different input windows of different sizes, Balasubramanian teaches away from the claimed configuration.

In the Final Office Action, the Examiner first argues that the "input window" as claimed is equivalent to the "footprint" of Balasubramanian (see Office Action mailed January 24, 2006, at page 3, paragraph a)) in support of the assertion that Balasubramanian teaches "generating a filter identifier based on one of an edge parameter computed based on the input pixel window" as claimed. The Examiner then argues that the "footprint" of Balasubramanian is common to the "input window" as claimed (see Office Action mailed January 24, 2006, at page 3, paragraph b)), in support of the assertion that Balasubramanian teaches "an activity metric not indicating an edge parameter computed based on the input pixel window" as claimed. Appellants respectfully assert that these assertions are contradictory. As described above, Balasubramanian teaches that different footprint sizes are used for determining different metrics (col. 7, lines 64 through col. 8, line 8).

By relying on these different definitions of "footprint," the Examiner has failed to establish a prima facie rejection. In particular, by relying on different definitions of "footprint" in supporting the rejection of the claims, the Examiner has failed to establish that Balasubramanian discloses the claimed invention "arranged as in the claim." Accordingly, the aforementioned limitations are not taught or suggested by Balasubramanian, and thus an essential element needed for a prima facie rejection based on the cited reference is not present. Moreover, by relying on contradictory definitions of the term "footprint" in supporting the rejection of the claims, Appellants respectfully submit that Balasubramanian <u>teaches away from</u> the claimed configuration.

In view of the claim limitations not being shown or suggested in Balasubramanian, in combination with the above arguments, Appellants respectfully submit that independent Claims 1, 8 and 15 overcome the cited reference and are therefore allowable over Balasubramanian. Therefore, Appellants respectfully submit that Balasubramanian also does not teach or suggest the additional claimed features of the present invention as recited in Claims 2-7 that depend from independent Claim 1, Claims 9-14 that depend from independent Claim 8, and Claims 16, 17 and 19 that depend from independent Claim 15. Appellants respectfully submit that Claims 2-7, 9-14, 16, 17 and 19 also overcome the rejection under 35 U.S.C. § 102(e) as these claims are dependent on allowable base claims.

In summary, Appellants respectfully submit because key limitations of independent Claims 1, 8 and 15 (from which Claims 2-7, 9-14, 16, 17 and 19 depend) are not met by Balasubramanian, Appellants respectfully submit that the rejection of Claims 1-17 and 19 under 35 U.S.C. §102(e) as being anticipated by Balasubramanian is improper and should be reversed.

Conclusion

Appellants believe that pending Claims 1-17 and 19 are patentable over Balasubramanian. As such, Appellants submit that Claims 1-17 and 19 are not anticipated by Balasubramanian and, therefore, are patentable over the prior art.

Appellants respectfully request that the rejection of Claims 1-17 and 19 be reversed. The Appellants wish to encourage the Examiner or a member of the Board of Patent Appeals to telephone the Appellants' undersigned representative if it is felt that a telephone conference could expedite prosecution.

Respectfully submitted,
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Dated: 8/2/, 2006

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VIII. Appendix - Clean Copy of Claims on Appeal

1. (Previously Presented) An image processing system comprising:

a filter selection mechanism for receiving an input pixel window and responsive thereto for generating a filter identifier based on one of an edge parameter computed based on the input pixel window and an activity metric not indicating an edge parameter computed based on the input pixel window, wherein a combination of both the edge parameter and the activity metric is not required for the generating of the filter identifier; and

a filter application unit coupled to the filter selection mechanism for receiving the filter identifier and applying a filter identified by the filter identifier to the input pixel window to generate an output pixel.

2. (Original) The image processing system of claim 1 further comprising:

an edge parameter evaluation unit for computing at least one edge parameter based on the input pixel window.

3. (Previously presented) The image processing system of claim 2 wherein the edge parameter is one of an edge angle, an edge sharpness, an edge curvature, and any measurable unit related to an edge.

4. (Original) The image processing system of claim 1 further comprising:

an activity metric evaluation unit for computing at least one activity metric based on the input pixel window.

5. (Previously Presented) The image processing system of claim 4 wherein the activity metric is selected from a group consisting of a level of variation of a red color plane, a level of variation of a green color plane, a level of variation of a blue color plane, a level of variation of a luminance plane, a mean absolute deviation of a red color plane, a mean

absolute deviation of a green color plane, a mean absolute deviation of a blue color plane, and a mean absolute deviation of a luminance plane.

6. (Original) The image processing system of claim 1 wherein the filter application unit includes a filter repository for providing a plurality of filters for use by the filter application unit.

7. (Original) The image processing system of claim 6 wherein the filter repository includes one of a blurring filter, a smoothing filter, a sharpening filter, and an enhancement filter.

8. (Previously Presented) A method for processing a digital image having a plurality of input pixels comprising:

for each input pixel associated with the digital image

receiving an input pixel window corresponding to a current input pixel;

generating a filter identifier based on one of an edge parameter and an activity metric not indicating an edge parameter, wherein a combination of both the edge parameter and the activity metric is not required for the generating of the filter identifier; and

applying a filter specified by the filter identifier to the input pixel window to generate an output pixel corresponding to the current input pixel.

9. (Previously Presented) The method of claim 8 wherein the step of receiving the input pixel window corresponding to the current input pixel includes the step of:

receiving the input pixel window that includes the current input pixel and pixels adjacent to the current input pixel.

10. (Previously Presented) The method of claim 8 wherein the step of receiving the input pixel window corresponding to the current input pixel includes the step of:

receiving the input pixel window that includes a N x N square of pixels centered about the current input pixel.

11. (Previously Presented) The method of claim 8 wherein the step of generating the filter identifier based on one of the edge parameter and the activity metric includes the steps of:

computing at least one edge parameter based on the input pixel window; and

utilizing the edge parameter to generate the filter identifier.

12. (Previously Presented) The method of claim 11 wherein the step of computing at least one edge parameter based on the input pixel window includes the step of:

computing one of an edge angle, an edge sharpness, an edge curvature, and any measurable unit related to an edge.

13. (Previously Presented) The method of claim 8 wherein the step of generating the filter identifier based on one of the edge parameter and the activity metric includes the steps of:

computing the activity metric based on the input pixel window; and

using the activity metric to generate the filter identifier.

14. (Previously Presented) The method of claim 13 wherein the step of computing the activity metric based on the input pixel window includes the steps of:

computing one of a level of variation of a red color plane, a level of variation of a green color plane, a level of variation of a blue color plane, a level of variation of a luminance plane, a mean absolute deviation of a red color plane, a mean absolute deviation of a green color plane, a mean absolute deviation of a blue color plane, and a mean absolute deviation of a luminance plane.

15. (Previously Presented) A method for processing a digital image having a plurality of input pixels comprising:

receiving the digital image; and

for each input pixel associated with the digital image

generating a level of variation based on a first window of pixels with reference to an input pixel;

determining whether the level of variation is in a predetermined relationship with a predetermined level of variation;

when the level of variation is in the predetermined relationship with the predetermined level of variation, applying a first filter; and

when the level of variation is not in the predetermined relationship with the predetermined level of variation, generating a measure of an edge parameter based on a second window of pixels with reference to the input pixel, selecting an enhancement filter based on the measurement of the edge parameter, and applying the selected enhancement filter to a third window to generate an output pixel corresponding to a current input pixel being processed from the each input pixel associated with the digital image, wherein a combination of both the edge parameter and the level of variation is not required for the selecting of the enhancement filter, and wherein the first window, the second window, and the third window are the same window of pixels.

16. (Original) The method of claim 15 wherein the second window includes a neighborhood of pixels that includes the current input pixel.

17. (Original) The method of claim 15 wherein the first filter is a low pass filter that replaces the current input pixel with a blurred version of the current input pixel.

18 (Previously Presented) The method of claim 15 wherein the step of generating the level of variation based on the first window of pixels with reference to the input pixel includes

determining a mean absolute deviation (MAD) for color planes based on the first window of pixels; wherein the first window includes the input pixel;

wherein the step of determining whether the level of variation is in the predetermined relationship with the predetermined level of variation includes comparing the MAD with the predetermined threshold;

wherein the step of when the level of variation is in a predetermined relationship with the predetermined level of variation includes when the MAD is less than the predetermined threshold, applying a low pass filter to the input pixel to generate the output pixel;

wherein the step of when the level of variation is not in the predetermined relationship with the predetermined level of variation includes when the MAD is not less than the predetermined threshold, selectively applying to the third window of pixels one set of filter coefficients selected from a group of sets of enhancement filter coefficients based on at least one edge parameter computed from the second window of pixels to generate the output pixel.

19 (Previously Presented) The method of claim 15 wherein the step of generating the measure of the edge parameter based on the second window of pixels with reference to the input pixel includes the step of:

computing one of an edge angle, an edge sharpness, an edge curvature, and any measurable unit related to an edge.

20. (Cancelled)

IX. Evidence Appendix

No evidence is herein appended.

X. Related Proceedings Appendix

No related proceedings.